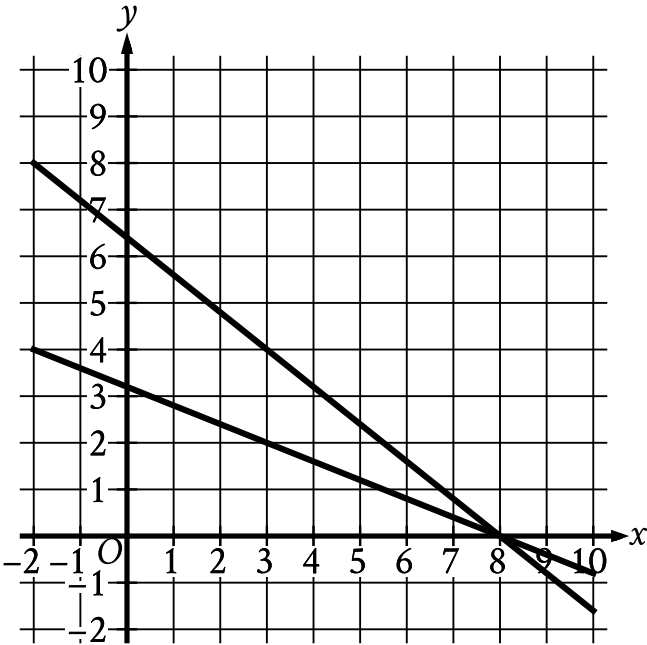


Question ID 3f5a3602

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■ ■ ■

ID: 3f5a3602



What system of linear equations is represented by the lines shown?

- A. $8x + 4y = 32 - 10x - 4y = -64$
- B. $8x - 4y = 32 - 10x + 4y = -64$
- C. $4x - 10y = 32 - 8x + 10y = -64$
- D. $4x + 10y = 32 - 8x - 10y = -64$

ID: 3f5a3602 Answer

Correct Answer: D

Rationale

Choice D is correct. A line in the xy -plane that passes through the points (x_1, y_1) and (x_2, y_2) has slope m , where $m = \frac{y_2 - y_1}{x_2 - x_1}$, and can be defined by an equation of the form $y - y_1 = m(x - x_1)$. One of the lines shown in the graph passes through the points $(8, 0)$ and $(3, 4)$. Substituting 8 for x_1 , 0 for y_1 , 3 for x_2 , and 4 for y_2 in the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{4 - 0}{3 - 8}$, or $m = -\frac{4}{5}$. Substituting $-\frac{4}{5}$ for m , 8 for x_1 and 0 for y_1 in the equation $y - y_1 = m(x - x_1)$ yields $y - 0 = -\frac{4}{5}(x - 8)$, which is equivalent to $y = -\frac{4}{5}x + \frac{32}{5}$. Adding $\frac{4}{5}x$ to both sides of this equation yields $\frac{4}{5}x + y = \frac{32}{5}$. Multiplying both sides of this equation by -10 yields $-8x - 10y = -64$. Therefore, an equation of this line is $-8x - 10y = -64$. Similarly, the other line shown in the graph passes through the points $(8, 0)$ and $(3, 2)$. Substituting 8 for x_1 , 0 for y_1 , 3 for x_2 , and 2 for y_2 in the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{2 - 0}{3 - 8}$, or $m = -\frac{2}{5}$. Substituting $-\frac{2}{5}$ for m , 8 for x_1 , and 0 for y_1 in the equation $y - y_1 = m(x - x_1)$ yields $y - 0 = -\frac{2}{5}(x - 8)$, which is equivalent to $y = -\frac{2}{5}x + \frac{16}{5}$. Adding $\frac{2}{5}x$ to both sides of this equation yields $\frac{2}{5}x + y = \frac{16}{5}$. Multiplying both sides of this equation by 10 yields $4x + 10y = 32$. Therefore, an equation of this line is $4x + 10y = 32$. So, the system of linear equations represented by the lines shown is $4x + 10y = 32$ and $-8x - 10y = -64$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 3d1070c9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: 3d1070c9

The function f is defined by $f(x) = 25x + 30$. What is the value of $f(x)$ when $x = 2$?

- A. 50
- B. 57
- C. 80
- D. 110

ID: 3d1070c9 Answer

Correct Answer: C

Rationale

Choice C is correct. It’s given that the function f is defined by $f(x) = 25x + 30$. Substituting 2 for x in this equation yields $f(2) = 25(2) + 30$, which is equivalent to $f(2) = 50 + 30$, or $f(2) = 80$. Therefore, the value of $f(x)$ is 80 when $x = 2$.

Choice A is incorrect. This is the value of $25(2)$, not $25(2) + 30$.

Choice B is incorrect. This is the value of $25 + 2 + 30$, not $25(2) + 30$.

Choice D is incorrect. This is the value of $(25 + 30)(2)$, not $25(2) + 30$.

Question Difficulty: Easy

Question ID 002dba45

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: 002dba45

Line k is defined by $y = -\frac{17}{3}x + 5$. Line j is perpendicular to line k in the xy -plane. What is the slope of line j ?

ID: 002dba45 Answer

Correct Answer: .1764, .1765, 3/17

Rationale

The correct answer is $\frac{3}{17}$. It's given that line j is perpendicular to line k in the xy -plane. This means that the slope of line j is the negative reciprocal of the slope of line k . The equation of line k , $y = -\frac{17}{3}x + 5$, is written in slope-intercept form $y = mx + b$, where m is the slope of the line and b is the y -coordinate of the y -intercept of the line. It follows that the slope of line k is $-\frac{17}{3}$. The negative reciprocal of a number is -1 divided by the number. Therefore, the negative reciprocal of $-\frac{17}{3}$ is $\frac{-1}{-\frac{17}{3}}$, or $\frac{3}{17}$. Thus, the slope of line j is $\frac{3}{17}$. Note that 3/17, .1764, .1765, and 0.176 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID edc1b7b7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: edc1b7b7

$2(8x) + 4(7y) = 12 - 2(8x) + 4(7y) = 12$

The solution to the given system of equations is (x, y) . What is the value of $8x + 7y$?

ID: edc1b7b7 Answer

Correct Answer: 3

Rationale

The correct answer is **3**. Adding the second equation to the first equation in the given system of equations yields $(2(8x) - 2(8x)) + (4(7y) + 4(7y)) = 12 + 12$, or $8(7y) = 24$. Dividing both sides of this equation by 8 yields $7y = 3$. Substituting **3** for $7y$ in the first equation, $2(8x) + 4(7y) = 12$, yields $2(8x) + 4(3) = 12$, or $2(8x) + 12 = 12$. Subtracting **12** from both sides of this equation yields $2(8x) = 0$. Dividing both sides of this equation by 2 yields $8x = 0$. Substituting **0** for $8x$ and **3** for $7y$ in the expression $8x + 7y$ yields $0 + 3$, or **3**. Therefore, the value of $8x + 7y$ is **3**.

Question Difficulty: Hard

Question ID f224df07

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	<div><div></div><div></div><div></div></div>

ID: f224df07

A cargo helicopter delivers only 100-pound packages and 120-pound packages. For each delivery trip, the helicopter must carry at least 10 packages, and the total weight of the packages can be at most 1,100 pounds. What is the maximum number of 120-pound packages that the helicopter can carry per trip?

- A. 2
- B. 4
- C. 5
- D. 6

ID: f224df07 Answer

Correct Answer: C

Rationale

Choice C is correct. Let a equal the number of 120-pound packages, and let b equal the number of 100-pound packages. It's given that the total weight of the packages can be at most 1,100 pounds: the inequality $120a + 100b \leq 1,100$ represents this situation. It's also given that the helicopter must carry at least 10 packages: the inequality $a + b \geq 10$ represents this situation. Values of a and b that satisfy these two inequalities represent the allowable numbers of 120-pound packages and 100-pound packages the helicopter can transport. To maximize the number of 120-pound packages, a , in the helicopter, the number of 100-pound packages, b , in the helicopter needs to be minimized. Expressing b in terms of a in the second inequality yields $b \geq 10 - a$, so the minimum value of b is equal to $10 - a$. Substituting $10 - a$ for b in the first inequality results in $120a + 100(10 - a) \leq 1,100$. Using the distributive property to rewrite this inequality yields $120a + 1,000 - 100a \leq 1,100$, or $20a + 1,000 \leq 1,100$. Subtracting 1,000 from both sides of this inequality yields $20a \leq 100$. Dividing both sides of this inequality by 20 results in $a \leq 5$. This means that the maximum number of 120-pound packages that the helicopter can carry per trip is 5.

Choices A, B, and D are incorrect and may result from incorrectly creating or solving the system of inequalities.

Question Difficulty: Medium

Question ID bd9eb2b5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: bd9eb2b5

The function f is defined by $f(x) = 8x$. For what value of x does $f(x) = 72$?

- A. 8
- B. 9
- C. 64
- D. 80

ID: bd9eb2b5 Answer

Correct Answer: B

Rationale

Choice B is correct. Substituting 72 for $f(x)$ in the given function yields $72 = 8x$. Dividing each side of this equation by 8 yields $9 = x$. Therefore, $f(x) = 72$ when the value of x is 9 .

Choice A is incorrect. This is the value of x for which $f(x) = 64$, not $f(x) = 72$.

Choice C is incorrect. This is the value of x for which $f(x) = 512$, not $f(x) = 72$.

Choice D is incorrect. This is the value of x for which $f(x) = 640$, not $f(x) = 72$.

Question Difficulty: Easy

Question ID fa80893a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	<div><div></div><div></div><div></div></div>

ID: fa80893a

If $2x + 3 = 9$, what is the value of $6x - 1$?

ID: fa80893a Answer

Correct Answer: 17

Rationale

The correct answer is **17**. It's given that $2x + 3 = 9$. Multiplying each side of this equation by **3** yields $3(2x + 3) = 3(9)$, or $6x + 9 = 27$. Subtracting **10** from each side of this equation yields $6x + 9 - 10 = 27 - 10$, or $6x - 1 = 17$. Therefore, the value of $6x - 1$ is **17**.

Question Difficulty: Easy

Question ID 1480dd5c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: 1480dd5c

$f(x) = 4x + b$ For the linear function f , b is a constant and $f(7) = 28$. What is the value of b ?

- A. 0
- B. 1
- C. 4
- D. 7

ID: 1480dd5c Answer

Correct Answer: A

Rationale

Choice A is correct. For the linear function f , it's given that $f(7) = 28$. Substituting 7 for x and 28 for $f(x)$ in the given function yields $28 = 4(7) + b$, or $28 = 28 + b$. Subtracting 28 from each side of this equation yields $0 = b$. Therefore, the value of b is 0.

Choice B is incorrect. Substituting 1 for b in the given function yields $f(x) = 4x + 1$. For this function, when the value of x is 7, the value of $f(x)$ is 29, not 28.

Choice C is incorrect. Substituting 4 for b in the given function yields $f(x) = 4x + 4$. For this function, when the value of x is 7, the value of $f(x)$ is 32, not 28.

Choice D is incorrect. Substituting 7 for b in the given function yields $f(x) = 4x + 7$. For this function, when the value of x is 7, the value of $f(x)$ is 35, not 28.

Question Difficulty: Easy

Question ID 3008cfc3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: 3008cfc3

x	y
k	13
$k + 7$	-15

The table gives the coordinates of two points on a line in the xy -plane. The y -intercept of the line is $(k - 5, b)$, where k and b are constants. What is the value of b ?

ID: 3008cfc3 Answer

Correct Answer: 33

Rationale

The correct answer is **33**. It's given in the table that the coordinates of two points on a line in the xy -plane are $(k, 13)$ and $(k + 7, -15)$. The y -intercept is another point on the line. The slope computed using any pair of points from the line will be the same. The slope of a line, m , between any two points, (x_1, y_1) and (x_2, y_2) , on the line can be calculated using the slope formula, $m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$. It follows that the slope of the line with the given points from the table, $(k, 13)$ and $(k + 7, -15)$, is $m = \frac{-15 - 13}{k + 7 - k}$, which is equivalent to $m = \frac{-28}{7}$, or $m = -4$. It's given that the y -intercept of the line is $(k - 5, b)$. Substituting -4 for m and the coordinates of the points $(k - 5, b)$ and $(k, 13)$ into the slope formula yields $-4 = \frac{13 - b}{k - (k - 5)}$, which is equivalent to $-4 = \frac{13 - b}{k - k + 5}$, or $-4 = \frac{13 - b}{5}$. Multiplying both sides of this equation by 5 yields $-20 = 13 - b$. Subtracting 13 from both sides of this equation yields $-33 = -b$. Dividing both sides of this equation by -1 yields $b = 33$. Therefore, the value of b is **33**.

Question Difficulty: Hard

Question ID 0d6ab461

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: 0d6ab461

Gabriella deposits **\$35** in a savings account at the end of each week. At the beginning of the **1st** week of a year there was **\$600** in that savings account. How much money, in dollars, will be in the account at the end of the **4th** week of that year?

- A. 460
- B. 635
- C. 639
- D. 740

ID: 0d6ab461 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that at the beginning of the **1st** week of the year there was **\$600** in a savings account and Gabriella deposits **\$35** in that savings account at the end of each week. Therefore, the amount of money, in dollars, in the savings account at the end of the **4th** week of that year is **$600 + 4(35)$** , or **740**.

Choice A is incorrect. This is the amount of money, in dollars, that will be in the account at the end of the **4th** week if Gabriella withdraws, rather than deposits, **\$35** at the end of each week.

Choice B is incorrect. This is the amount of money, in dollars, that will be in the account at the end of the **1st** week, not the **4th** week.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 4becad44

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: 4becad44

$3x = 36y - 45$

One of the two equations in a system of linear equations is given. The system has no solution. Which equation could be the second equation in this system?

- A. $x = 4y$
- B. $\frac{1}{3}x = 4y$
- C. $x = 12y - 15$
- D. $\frac{1}{3}x = 12y - 15$

ID: 4becad44 Answer

Correct Answer: B

Rationale

Choice B is correct. A system of two linear equations in two variables, x and y , has no solution when the lines in the xy -plane representing the equations are parallel and distinct. Two lines are parallel and distinct if their slopes are the same and their y -intercepts are different. The slope of the graph of the given equation, $3x = 36y - 45$, in the xy -plane can be found by rewriting the equation in the form $y = mx + b$, where m is the slope of the graph and $(0, b)$ is the y -intercept. Adding 45 to each side of the given equation yields $3x + 45 = 36y$. Dividing each side of this equation by 36 yields $\frac{1}{12}x + \frac{5}{4} = y$, or $y = \frac{1}{12}x + \frac{5}{4}$. It follows that the slope of the graph of the given equation is $\frac{1}{12}$ and the y -intercept is $(0, \frac{5}{4})$. Therefore, the graph of the second equation in the system must also have a slope of $\frac{1}{12}$, but must not have a y -intercept of $(0, \frac{5}{4})$. Multiplying each side of the equation given in choice B by $\frac{1}{4}$ yields $\frac{1}{12}x = y$, or $y = \frac{1}{12}x$. It follows that the graph representing the equation in choice B has a slope of $\frac{1}{12}$ and a y -intercept of $(0, 0)$. Since the slopes of the graphs of the two equations are equal and the y -intercepts of the graphs of the two equations are different, the equation in choice B could be the second equation in the system.

Choice A is incorrect. This equation can be rewritten as $y = \frac{1}{4}x$. It follows that the graph of this equation has a slope of $\frac{1}{4}$, so the system consisting of this equation and the given equation has exactly one solution, rather than no solution.

Choice C is incorrect. This equation can be rewritten as $y = \frac{1}{12}x + \frac{5}{4}$. It follows that the graph of this equation has a slope of $\frac{1}{12}$ and a y -intercept of $(0, \frac{5}{4})$, so the system consisting of this equation and the given equation has infinitely many solutions, rather than no solution.

Choice D is incorrect. This equation can be rewritten as $y = \frac{1}{36}x + \frac{5}{4}$. It follows that the graph of this equation has a slope of $\frac{1}{36}$, so the system consisting of this equation and the given equation has exactly one solution, rather than no solution.

Question Difficulty: Hard

Question ID d1b66ae6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: d1b66ae6

$$\begin{aligned} -x + y &= -3.5 \\ x + 3y &= 9.5 \end{aligned}$$

If (x, y) satisfies the system of equations above, what is the value of y ?

ID: d1b66ae6 Answer

Rationale

The correct answer is $\frac{3}{2}$. One method for solving the system of equations for y is to add corresponding sides of the two equations. Adding the left-hand sides gives $(-x + y) + (x + 3y)$, or $4y$. Adding the right-hand sides yields $-3.5 + 9.5 = 6$. It follows that $4y = 6$. Finally, dividing both sides of $4y = 6$ by 4 yields $y = \frac{6}{4}$ or $\frac{3}{2}$. Note that $3/2$ and 1.5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID cb8f449f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: cb8f449f

$$\frac{1}{2}y = 4$$

$$x - \frac{1}{2}y = 2$$

The system of equations above has solution (x, y). What is the value of x ?

- A. 3
- B. $\frac{7}{2}$
- C. 4
- D. 6

ID: cb8f449f Answer

Correct Answer: D

Rationale

Choice D is correct. Adding the corresponding sides of the two equations eliminates y and yields $x = 6$, as shown.

$$\begin{array}{r} \frac{1}{2}y = 4 \\ x - \frac{1}{2}y = 2 \\ \hline x + 0 = 6 \end{array}$$

If (x, y) is a solution to the system, then (x, y) satisfies both equations in the system and any equation derived from them. Therefore, $x = 6$.

Choices A, B, and C are incorrect and may be the result of errors when solving the system.

Question Difficulty: Medium

Question ID 520c8177

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: 520c8177

A veterinarian recommends that each day a certain rabbit should eat **25** calories per pound of the rabbit’s weight, plus an additional **11** calories. Which equation represents this situation, where c is the total number of calories the veterinarian recommends the rabbit should eat each day if the rabbit’s weight is x pounds?

- A. $c = 25x$
- B. $c = 36x$
- C. $c = 11x + 25$
- D. $c = 25x + 11$

ID: 520c8177 Answer

Correct Answer: D

Rationale

Choice D is correct. It’s given that a veterinarian recommends that each day the rabbit should eat **25** calories per pound of the rabbit’s weight, plus an additional **11** calories. If the rabbit’s weight is x pounds, then multiplying **25** calories per pound by the rabbit’s weight, x pounds, yields **25x** calories. Adding the additional **11** calories that the rabbit should eat each day yields **25x + 11** calories. It’s given that c is the total number of calories the veterinarian recommends the rabbit should eat each day if the rabbit’s weight is x pounds. Therefore, this situation can be represented by the equation $c = 25x + 11$.

Choice A is incorrect. This equation represents a situation where a veterinarian recommends that each day the rabbit should eat **25** calories per pound of the rabbit’s weight.

Choice B is incorrect. This equation represents a situation where a veterinarian recommends that each day the rabbit should eat **25 + 11**, or **36**, calories per pound of the rabbit’s weight.

Choice C is incorrect. This equation represents a situation where a veterinarian recommends that each day the rabbit should eat **11** calories per pound of the rabbit’s weight, plus an additional **25** calories.

Question Difficulty: Easy

Question ID 88e13c8c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: 88e13c8c

The total cost $f(x)$, in dollars, to lease a car for **36** months from a particular car dealership is given by $f(x) = 36x + 1,000$, where x is the monthly payment, in dollars. What is the total cost to lease a car when the monthly payment is **\$400**?

- A. **\$13,400**
- B. **\$13,000**
- C. **\$15,400**
- D. **\$37,400**

ID: 88e13c8c Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that $f(x)$ is the total cost, in dollars, to lease a car from this dealership with a monthly payment of x dollars. Therefore, the total cost, in dollars, to lease the car when the monthly payment is **\$400** is represented by the value of $f(x)$ when $x = 400$. Substituting **400** for x in the equation $f(x) = 36x + 1,000$ yields $f(400) = 36(400) + 1,000$, or $f(400) = 15,400$. Thus, when the monthly payment is **\$400**, the total cost to lease a car is **\$15,400**.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 3cdbf026

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■ ■ ■

ID: 3cdbf026

The graph of the equation $ax + ky = 6$ is a line in the xy -plane, where a and k are constants. If the line contains the points $(-2, -6)$ and $(0, -3)$, what is the value of k ?

- A. -2
- B. -1
- C. 2
- D. 3

ID: 3cdbf026 Answer

Correct Answer: A

Rationale

Choice A is correct. The value of k can be found using the slope-intercept form of a linear equation, $y = mx + b$, where m is the slope and b is the y -coordinate of the y -intercept. The equation $ax + ky = 6$ can be rewritten in the form $y = -\frac{ax}{k} + \frac{6}{k}$. One of the given points, $(0, -3)$, is the y -intercept. Thus, the y -coordinate of the y -intercept -3 must be equal to $\frac{6}{k}$. Multiplying both sides by k gives $-3k = 6$. Dividing both sides by -3 gives $k = -2$.

Choices B, C, and D are incorrect and may result from errors made rewriting the given equation.

Question Difficulty: Hard

Question ID 00723d16

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: 00723d16

Line ℓ is defined by $3y + 12x = 5$. Line n is perpendicular to line ℓ in the xy -plane. What is the slope of line n ?

ID: 00723d16 Answer

Correct Answer: 0.25, 1/4

Rationale

The correct answer is $\frac{1}{4}$. For an equation in slope-intercept form $y = mx + b$, m represents the slope of the line in the xy -plane defined by this equation. It's given that line ℓ is defined by $3y + 12x = 5$. Subtracting $12x$ from both sides of this equation yields $3y = -12x + 5$. Dividing both sides of this equation by 3 yields $y = -\frac{12}{3}x + \frac{5}{3}$, or $y = -4x + \frac{5}{3}$. Thus, the slope of line ℓ in the xy -plane is -4 . Since line n is perpendicular to line ℓ in the xy -plane, the slope of line n is the negative reciprocal of the slope of line ℓ . The negative reciprocal of -4 is $-\frac{1}{(-4)} = \frac{1}{4}$. Note that 1/4 and .25 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID ff501705

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: ff501705

$\frac{3}{2}y - \frac{1}{4}x = \frac{2}{3} - \frac{3}{2}y$ $\frac{1}{2}x + \frac{3}{2} = py + \frac{9}{2}$ $= py + \frac{9}{2}$

In the given system of equations, p is a constant. If the system has no solution, what is the value of p ?

ID: ff501705 Answer

Correct Answer: 6

Rationale

The correct answer is **6**. A system of two linear equations in two variables, x and y , has no solution if the lines represented by the equations in the xy -plane are parallel and distinct. Lines represented by equations in standard form, $Ax + By = C$ and $Dx + Ey = F$, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients in the other equation, meaning $\frac{D}{A} = \frac{E}{B}$; and the lines are distinct if the constants are not proportional, meaning $\frac{F}{C}$ is not equal to $\frac{D}{A}$ or $\frac{E}{B}$. The first equation in the given system is $\frac{3}{2}y - \frac{1}{4}x = \frac{2}{3} - \frac{3}{2}y$. Multiplying each side of this equation by **12** yields $18y - 3x = 8 - 18y$. Adding **18y** to each side of this equation yields $36y - 3x = 8$, or $-3x + 36y = 8$. The second equation in the given system is $\frac{1}{2}x + \frac{3}{2} = py + \frac{9}{2}$. Multiplying each side of this equation by **2** yields $x + 3 = 2py + 9$. Subtracting $2py$ from each side of this equation yields $x + 3 - 2py = 9$. Subtracting **3** from each side of this equation yields $x - 2py = 6$. Therefore, the two equations in the given system, written in standard form, are $-3x + 36y = 8$ and $x - 2py = 6$. As previously stated, if this system has no solution, the lines represented by the equations in the xy -plane are parallel and distinct, meaning the proportion $\frac{1}{-3} = \frac{-2p}{36}$, or $-\frac{1}{3} = -\frac{p}{18}$, is true and the proportion $\frac{6}{8} = \frac{1}{-3}$ is not true. The proportion $\frac{6}{8} = \frac{1}{-3}$ is not true. Multiplying each side of the true proportion, $-\frac{1}{3} = -\frac{p}{18}$, by **-18** yields **6 = p**. Therefore, if the system has no solution, then the value of p is **6**.

Question Difficulty: Hard

Question ID 8c5e6702

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: 8c5e6702

A window repair specialist charges \$220 for the first two hours of repair plus an hourly fee for each additional hour. The total cost for 5 hours of repair is \$400. Which function f gives the total cost, in dollars, for x hours of repair, where $x \geq 2$?

- A. $f(x) = 60x + 100$
- B. $f(x) = 60x + 220$
- C. $f(x) = 80x$
- D. $f(x) = 80x + 220$

ID: 8c5e6702 Answer

Correct Answer: A

Rationale

Choice A is correct. It’s given that the window repair specialist charges \$220 for the first two hours of repair plus an hourly fee for each additional hour. Let n represent the hourly fee for each additional hour after the first two hours. Since it’s given that x is the number of hours of repair, it follows that the charge generated by the hourly fee after the first two hours can be represented by the expression $n(x - 2)$. Therefore, the total cost, in dollars, for x hours of repair is $f(x) = 220 + n(x - 2)$. It’s given that the total cost for 5 hours of repair is \$400. Substituting 5 for x and 400 for $f(x)$ into the equation $f(x) = 220 + n(x - 2)$ yields $400 = 220 + n(5 - 2)$, or $400 = 220 + 3n$. Subtracting 220 from both sides of this equation yields $180 = 3n$. Dividing both sides of this equation by 3 yields $n = 60$. Substituting 60 for n in the equation $f(x) = 220 + n(x - 2)$ yields $f(x) = 220 + 60(x - 2)$, which is equivalent to $f(x) = 220 + 60x - 120$, or $f(x) = 60x + 100$. Therefore, the total cost, in dollars, for x hours of repair is $f(x) = 60x + 100$.

Choice B is incorrect. This function represents the total cost, in dollars, for x hours of repair where the specialist charges \$340, rather than \$220, for the first two hours of repair.

Choice C is incorrect. This function represents the total cost, in dollars, for x hours of repair where the specialist charges \$160, rather than \$220, for the first two hours of repair, and an hourly fee of \$80, rather than \$60, after the first two hours.

Choice D is incorrect. This function represents the total cost, in dollars, for x hours of repair where the specialist charges \$380, rather than \$220, for the first two hours of repair, and an hourly fee of \$80, rather than \$60, after the first two hours.

Question Difficulty: Hard

Question ID 2937ef4f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■ ■ ■

ID: 2937ef4f

Hector used a tool called an auger to remove corn from a storage bin at a constant rate. The bin contained 24,000 bushels of corn when Hector began to use the auger. After 5 hours of using the auger, 19,350 bushels of corn remained in the bin. If the auger continues to remove corn at this rate, what is the total number of hours Hector will have been using the auger when 12,840 bushels of corn remain in the bin?

- A. 3
- B. 7
- C. 8
- D. 12

ID: 2937ef4f Answer

Correct Answer: D

Rationale

Choice D is correct. After using the auger for 5 hours, Hector had removed $24,000 - 19,350 = 4,650$ bushels of corn from the storage bin. During the 5-hour period, the auger removed corn from the bin at a constant rate of $\frac{4,650}{5} = 930$ bushels per hour. Assuming the auger continues to remove corn at this rate, after x hours it will have removed $930x$ bushels of corn. Because the bin contained 24,000 bushels of corn when Hector started using the auger, the equation $24,000 - 930x = 12,840$ can be used to find the number of hours, x , Hector will have been using the auger when 12,840 bushels of corn remain in the bin. Subtracting 12,840 from both sides of this equation and adding $930x$ to both sides of the equation yields $11,160 = 930x$. Dividing both sides of this equation by 930 yields $x = 12$. Therefore, Hector will have been using the auger for 12 hours when 12,840 bushels of corn remain in the storage bin.

Choice A is incorrect. Three hours after Hector began using the auger, $24,000 - 3(930) = 21,210$ bushels of corn remained, not 12,840. Choice B is incorrect. Seven hours after Hector began using the auger, $24,000 - 7(930) = 17,490$ bushels of corn will remain, not 12,840. Choice C is incorrect. Eight hours after Hector began using the auger, $24,000 - 8(930) = 16,560$ bushels of corn will remain, not 12,840.

Question Difficulty: Hard

Question ID 548a4929

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: 548a4929

The function h is defined by $h(x) = 4x + 28$. The graph of $y = h(x)$ in the xy -plane has an x -intercept at $(a, 0)$ and a y -intercept at $(0, b)$, where a and b are constants. What is the value of $a + b$?

- A. 21
- B. 28
- C. 32
- D. 35

ID: 548a4929 Answer

Correct Answer: A

Rationale

Choice A is correct. The x -intercept of a graph in the xy -plane is the point on the graph where $y = 0$. It's given that function h is defined by $h(x) = 4x + 28$. Therefore, the equation representing the graph of $y = h(x)$ is $y = 4x + 28$. Substituting 0 for y in the equation $y = 4x + 28$ yields $0 = 4x + 28$. Subtracting 28 from both sides of this equation yields $-28 = 4x$. Dividing both sides of this equation by 4 yields $-7 = x$. Therefore, the x -intercept of the graph of $y = h(x)$ in the xy -plane is $(-7, 0)$. It's given that the x -intercept of the graph of $y = h(x)$ is $(a, 0)$. Therefore, $a = -7$. The y -intercept of a graph in the xy -plane is the point on the graph where $x = 0$. Substituting 0 for x in the equation $y = 4x + 28$ yields $y = 4(0) + 28$, or $y = 28$. Therefore, the y -intercept of the graph of $y = h(x)$ in the xy -plane is $(0, 28)$. It's given that the y -intercept of the graph of $y = h(x)$ is $(0, b)$. Therefore, $b = 28$. If $a = -7$ and $b = 28$, then the value of $a + b$ is $-7 + 28$, or 21.

Choice B is incorrect. This is the value of b , not $a + b$.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the value of $-a + b$, not $a + b$.

Question Difficulty: Medium

Question ID 0adbe034

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	<div><div></div><div></div><div></div></div>

ID: 0adbe034

If $4x - 28 = -24$, what is the value of $x - 7$?

- A. -24
- B. -22
- C. -6
- D. -1

ID: 0adbe034 Answer

Correct Answer: C

Rationale

Choice C is correct. Dividing all terms in the given equation by 4 yields $\frac{4x}{4} - \frac{28}{4} = -\frac{24}{4}$, or $x - 7 = -6$. Therefore, the value of $x - 7$ is -6 .

Choice A is incorrect. This is the value of $4x - 28$, not $x - 7$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 9bbce683

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: 9bbce683

x	y
18	130
23	160
26	178

For line h , the table shows three values of x and their corresponding values of y . Line k is the result of translating line h down 5 units in the xy -plane. What is the x -intercept of line k ?

- A. $(-\frac{26}{3}, 0)$
- B. $(-\frac{9}{2}, 0)$
- C. $(-\frac{11}{3}, 0)$
- D. $(-\frac{17}{6}, 0)$

ID: 9bbce683 Answer

Correct Answer: D

Rationale

Choice D is correct. The equation of line h can be written in slope-intercept form $y = mx + b$, where m is the slope of the line and $(0, b)$ is the y -intercept of the line. It's given that line h contains the points $(18, 130)$, $(23, 160)$, and $(26, 178)$. Therefore, its slope m can be found as $\frac{160-130}{23-18}$, or 6. Substituting 6 for m in the equation $y = mx + b$ yields $y = 6x + b$. Substituting 130 for y and 18 for x in this equation yields $130 = 6(18) + b$, or $130 = 108 + b$. Subtracting 108 from both sides of this equation yields $22 = b$. Substituting 22 for b in $y = 6x + b$ yields $y = 6x + 22$. Since line k is the result of translating line h down 5 units, an equation of line k is $y = 6x + 22 - 5$, or $y = 6x + 17$. Substituting 0 for y in this equation yields $0 = 6x + 17$. Solving this equation for x yields $x = -\frac{17}{6}$. Therefore, the x -intercept of line k is $(-\frac{17}{6}, 0)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 2b15d65f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: 2b15d65f

An economist modeled the demand Q for a certain product as a linear function of the selling price P . The demand was 20,000 units when the selling price was \$40 per unit, and the demand was 15,000 units when the selling price was \$60 per unit. Based on the model, what is the demand, in units, when the selling price is \$55 per unit?

- A. 16,250
- B. 16,500
- C. 16,750
- D. 17,500

ID: 2b15d65f Answer

Correct Answer: A

Rationale

Choice A is correct. Let the economist’s model be the linear function $Q = mP + b$, where Q is the demand, P is the selling price, m is the slope of the line, and b is the y -coordinate of the y -intercept of the line in the xy -plane, where $y = Q$. Two pairs of the selling price P and the demand Q are given. Using the coordinate pairs (P, Q) , two points that satisfy the function are $(40, 20,000)$ and $(60, 15,000)$. The slope m of the function can be found using the formula $m = \frac{Q_2 - Q_1}{P_2 - P_1}$. Substituting the given values into this formula yields $m = \frac{15,000 - 20,000}{60 - 40}$, or $m = -250$. Therefore, $Q = -250P + b$. The value of b can be found by substituting one of the points into the function. Substituting the values of P and Q from the point $(40, 20,000)$ yields $20,000 = -250(40) + b$, or $20,000 = -10,000 + b$. Adding 10,000 to both sides of this equation yields $b = 30,000$. Therefore, the linear function the economist used as the model is $Q = -250P + 30,000$. Substituting 55 for P yields $Q = -250(55) + 30,000 = 16,250$. It follows that when the selling price is \$55 per unit, the demand is 16,250 units.

Choices B, C, and D are incorrect and may result from calculation or conceptual errors.

Question Difficulty: Hard

Question ID 686b7244

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: 686b7244

A certain apprentice has enrolled in **85** hours of training courses. The equation $10x + 15y = 85$ represents this situation, where x is the number of on-site training courses and y is the number of online training courses this apprentice has enrolled in. How many more hours does each online training course take than each on-site training course?

ID: 686b7244 Answer

Correct Answer: 5

Rationale

The correct answer is **5**. It's given that the equation $10x + 15y = 85$ represents the situation, where x is the number of on-site training courses, y is the number of online training courses, and **85** is the total number of hours of training courses the apprentice has enrolled in. Therefore, $10x$ represents the number of hours the apprentice has enrolled in on-site training courses, and $15y$ represents the number of hours the apprentice has enrolled in online training courses. Since x is the number of on-site training courses and y is the number of online training courses the apprentice has enrolled in, **10** is the number of hours each on-site course takes and **15** is the number of hours each online course takes. Subtracting these numbers gives $15 - 10$, or **5** more hours each online training course takes than each on-site training course.

Question Difficulty: Hard

Question ID b86123af

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: b86123af

Hiro and Sofia purchased shirts and pants from a store. The price of each shirt purchased was the same and the price of each pair of pants purchased was the same. Hiro purchased 4 shirts and 2 pairs of pants for \$86, and Sofia purchased 3 shirts and 5 pairs of pants for \$166. Which of the following systems of linear equations represents the situation, if x represents the price, in dollars, of each shirt and y represents the price, in dollars, of each pair of pants?

- A.

$4x + 2y = 86$

$3x + 5y = 166$
- B.

$4x + 3y = 86$

$2x + 5y = 166$
- C.

$4x + 2y = 166$

$3x + 5y = 86$
- D.

$4x + 3y = 166$

$2x + 5y = 86$

ID: b86123af Answer

Correct Answer: A

Rationale

Choice A is correct. Hiro purchased 4 shirts and each shirt cost x dollars, so he spent a total of $4x$ dollars on shirts. Likewise, Hiro purchased 2 pairs of pants, and each pair of pants cost y dollars, so he spent a total of $2y$ dollars on pants. Therefore, the total amount that Hiro spent was $4x + 2y$. Since Hiro spent \$86 in total, this can be modeled by the equation $4x + 2y = 86$. Using the same reasoning, Sofia bought 3 shirts at x dollars each and 5 pairs of pants at y dollars each, so she spent a total of $3x + 5y$ dollars on shirts and pants. Since Sofia spent \$166 in total, this can be modeled by the equation $3x + 5y = 166$.

Choice B is incorrect and may be the result of switching the number of shirts Sofia purchased with the number of pairs of pants Hiro purchased. Choice C is incorrect and may be the result of switching the total price each person paid. Choice D is incorrect and may be the result of switching the total price each person paid as well as switching the number of shirts Sofia purchased with the number of pairs of pants Hiro purchased.

Question Difficulty: Easy

Question ID 3a3b95df

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: 3a3b95df

$d = 16 - \frac{x}{30}$

The equation shown gives the estimated amount of diesel d , in gallons, that remains in the gas tank of a truck after being driven x miles, where $0 \leq x \leq 480$. What is the estimated amount of diesel, in gallons, that remains in the gas tank of the truck when $x = 300$?

- A. 0
- B. 6
- C. 14
- D. 16

ID: 3a3b95df Answer

Correct Answer: B

Rationale

Choice B is correct. It’s given that the equation $d = 16 - \frac{x}{30}$ gives the estimated amount of diesel d , in gallons, that remains in the gas tank of the truck after being driven x miles. Substituting **300** for x in the given equation yields $d = 16 - \frac{300}{30}$, which is equivalent to $d = 16 - 10$, or $d = 6$. Therefore, the estimated amount of diesel that remains in the gas tank of the truck when $x = 300$ is **6** gallons.

Choice A is incorrect. This is the estimated amount of diesel, in gallons, that will remain in the gas tank of the truck when $x = 480$, not when $x = 300$.

Choice C is incorrect. This is the estimated amount of diesel, in gallons, that will remain in the gas tank of the truck when $x = 60$, not when $x = 300$.

Choice D is incorrect. This is the estimated amount of diesel, in gallons, that will remain in the gas tank of the truck when $x = 0$, not when $x = 300$.

Question Difficulty: Easy

Question ID 1b1deebe

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: 1b1deebe

$ax + by = 72$ $6x + 2by = 56$

In the given system of equations, a and b are constants. The graphs of these equations in the xy -plane intersect at the point $(4, y)$. What is the value of a ?

- A. 3
- B. 4
- C. 6
- D. 14

ID: 1b1deebe Answer

Correct Answer: D

Rationale

Choice D is correct. It’s given that the graphs of the given system of equations intersect at the point $(4, y)$. Therefore, $(4, y)$ is the solution to the given system. Multiplying the first equation in the given system by -2 yields $-2ax - 2by = -144$. Adding this equation to the second equation in the system yields $(-2a + 6)x + (-2b + 2b)y = (-144 + 56)$, or $(-2a + 6)x = -88$. Since $(4, y)$ is the solution to the system, the value of a can be found by substituting 4 for x in this equation, which yields $(-2a + 6)(4) = -88$. Dividing both sides of this equation by 4 yields $-2a + 6 = -22$. Subtracting 6 from both sides of this equation yields $-2a = -28$. Dividing both sides of this equation by -2 yields $a = 14$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID ee846db7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: ee846db7

A store sells two different-sized containers of a certain Greek yogurt. The store’s sales of this Greek yogurt totaled **1,277.94** dollars last month. The equation **$5.48x + 7.30y = 1,277.94$** represents this situation, where **x** is the number of smaller containers sold and **y** is the number of larger containers sold. According to the equation, which of the following represents the price, in dollars, of each smaller container?

- A. **5.48**
- B. **$7.30y$**
- C. **7.30**
- D. **$5.48x$**

ID: ee846db7 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the store's sales of a certain Greek yogurt totaled **1,277.94** dollars last month. It's also given that the equation **$5.48x + 7.30y = 1,277.94$** represents this situation, where **x** is the number of smaller containers sold and **y** is the number of larger containers sold. Since **x** represents the number of smaller containers of yogurt sold, the expression **$5.48x$** represents the total sales, in dollars, from smaller containers of yogurt. This means that **x** smaller containers of yogurt were sold at a price of **5.48** dollars each. Therefore, according to the equation, **5.48** represents the price, in dollars, of each smaller container.

Choice B is incorrect. This expression represents the total sales, in dollars, from selling **y** larger containers of yogurt.

Choice C is incorrect. This value represents the price, in dollars, of each larger container of yogurt.

Choice D is incorrect. This expression represents the total sales, in dollars, from selling **x** smaller containers of yogurt.

Question Difficulty: Easy

Question ID baca4a4c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	<div><div></div><div></div><div></div></div>

ID: baca4a4c

$7(2x - 3) = 63$ Which equation has the same solution as the given equation?

- A. $2x - 3 = 9$
- B. $2x - 3 = 56$
- C. $2x - 21 = 63$
- D. $2x - 21 = 70$

ID: baca4a4c Answer

Correct Answer: A

Rationale

Choice A is correct. Dividing each side of the given equation by 7 yields $\frac{7(2x-3)}{7} = \frac{63}{7}$, or $2x - 3 = 9$. Therefore, the equation $2x - 3 = 9$ is equivalent to the given equation and has the same solution.

Choice B is incorrect. This equation is equivalent to $7(2x - 3) = 392$, not $7(2x - 3) = 63$.

Choice C is incorrect. Distributing 7 on the left-hand side of the given equation yields $14x - 21 = 63$, not $2x - 21 = 63$.

Choice D is incorrect. Distributing 7 on the left-hand side of the given equation yields $14x - 21 = 63$, not $2x - 21 = 70$.

Question Difficulty: Easy

Question ID 5b8a8475

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: 5b8a8475

Line k is defined by $y = 3x + 15$. Line j is perpendicular to line k in the xy -plane. What is the slope of line j ?

- A. $-\frac{1}{3}$
- B. $-\frac{1}{12}$
- C. $-\frac{1}{18}$
- D. $-\frac{1}{45}$

ID: 5b8a8475 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that line j is perpendicular to line k in the xy -plane. It follows that the slope of line j is the opposite reciprocal of the slope of line k . The equation for line k is written in slope-intercept form $y = mx + b$, where m is the slope of the line and b is the y -coordinate of the y -intercept of the line. It follows that the slope of line k is 3 . The opposite reciprocal of a number is -1 divided by the number. Thus, the opposite reciprocal of 3 is $-\frac{1}{3}$. Therefore, the slope of line j is $-\frac{1}{3}$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID cfe67646

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	<div><div></div><div></div><div></div></div>

ID: cfe67646

The point $(8, 2)$ in the xy -plane is a solution to which of the following systems of inequalities?

- A. $x > 0$ $y > 0$
- B. $x > 0$ $y < 0$
- C. $x < 0$ $y > 0$
- D. $x < 0$ $y < 0$

ID: cfe67646 Answer

Correct Answer: A

Rationale

Choice A is correct. The given point, $(8, 2)$, is located in the first quadrant in the xy -plane. The system of inequalities in choice A represents all the points in the first quadrant in the xy -plane. Therefore, $(8, 2)$ is a solution to the system of inequalities in choice A.

Alternate approach: Substituting 8 for x in the first inequality in choice A, $x > 0$, yields $8 > 0$, which is true. Substituting 2 for y in the second inequality in choice A, $y > 0$, yields $2 > 0$, which is true. Since the coordinates of the point $(8, 2)$ make the inequalities $x > 0$ and $y > 0$ true, the point $(8, 2)$ is a solution to the system of inequalities consisting of $x > 0$ and $y > 0$.

Choice B is incorrect. This system of inequalities represents all the points in the fourth quadrant, not the first quadrant, in the xy -plane.

Choice C is incorrect. This system of inequalities represents all the points in the second quadrant, not the first quadrant, in the xy -plane.

Choice D is incorrect. This system of inequalities represents all the points in the third quadrant, not the first quadrant, in the xy -plane.

Question Difficulty: Easy

Question ID 608eeb6e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: 608eeb6e

$5x = 15$ $-4x + y = -2$ The solution to the given system of equations is (x, y) . What is the value of $x + y$?

- A. -17
- B. -13
- C. 13
- D. 17

ID: 608eeb6e Answer

Correct Answer: C

Rationale

Choice C is correct. Adding the second equation of the given system to the first equation yields $5x + (-4x + y) = 15 + (-2)$, which is equivalent to $x + y = 13$. So the value of $x + y$ is 13 .

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the value of $-(x + y)$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID be9cb6a2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: be9cb6a2

The cost of renting a backhoe for up to **10** days is **\$270** for the first day and **\$135** for each additional day. Which of the following equations gives the cost ***y***, in dollars, of renting the backhoe for ***x*** days, where ***x*** is a positive integer and **$x \leq 10$** ?

- A. $y = 270x - 135$
- B. $y = 270x + 135$
- C. $y = 135x + 270$
- D. $y = 135x + 135$

ID: be9cb6a2 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the cost of renting a backhoe for up to **10** days is **\$270** for the first day and **\$135** for each additional day. Therefore, the cost ***y***, in dollars, for ***x*** days, where **$x \leq 10$** , is the sum of the cost for the first day, **\$270**, and the cost for the additional **$x - 1$** days, **$\$135(x - 1)$** . It follows that **$y = 270 + 135(x - 1)$** , which is equivalent to **$y = 270 + 135x - 135$** , or **$y = 135x + 135$** .

Choice A is incorrect. This equation represents a situation where the cost of renting a backhoe is **\$135** for the first day and **\$270** for each additional day.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 097e10f5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	<div><div></div><div></div><div></div></div>

ID: 097e10f5

What value of p satisfies the equation $5p + 180 = 250$?

- A. 14
- B. 65
- C. 86
- D. 250

ID: 097e10f5 Answer

Correct Answer: A

Rationale

Choice A is correct. Subtracting 180 from both sides of the given equation yields $5p = 70$. Dividing both sides of this equation by 5 yields $p = 14$. Therefore, the value of p that satisfies the equation $5p + 180 = 250$ is 14.

Choice B is incorrect. This value of p satisfies the equation $5p + 180 = 505$.

Choice C is incorrect. This value of p satisfies the equation $5p + 180 = 610$.

Choice D is incorrect. This value of p satisfies the equation $5p + 180 = 1,430$.

Question Difficulty: Easy

Question ID 84664a7c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: 84664a7c

The front of a roller-coaster car is at the bottom of a hill and is 15 feet above the ground. If the front of the roller-coaster car rises at a constant rate of 8 feet per second, which of the following equations gives the height h , in feet, of the front of the roller-coaster car s seconds after it starts up the hill?

- A. $h = 8s + 15$
- B. $h = 15s + \frac{335}{8}$
- C. $h = 8s + \frac{335}{15}$
- D. $h = 15s + 8$

ID: 84664a7c Answer

Correct Answer: A

Rationale

Choice A is correct. It’s given that the front of the roller-coaster car starts rising when it’s 15 feet above the ground. This initial height of 15 feet can be represented by a constant term, 15, in an equation. Each second, the front of the roller-coaster car rises 8 feet, which can be represented by $8s$. Thus, the equation $h = 8s + 15$ gives the height, in feet, of the front of the roller-coaster car s seconds after it starts up the hill.

Choices B and C are incorrect and may result from conceptual errors in creating a linear equation. Choice D is incorrect and may result from switching the rate at which the roller-coaster car rises with its initial height.

Question Difficulty: Easy

Question ID e62cfe5f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: e62cfe5f

According to a model, the head width, in millimeters, of a worker bumblebee can be estimated by adding 0.6 to four times the body weight of the bee, in grams.
According to the model, what would be the head width, in millimeters, of a worker bumblebee that has a body weight of 0.5 grams?

ID: e62cfe5f Answer

Rationale

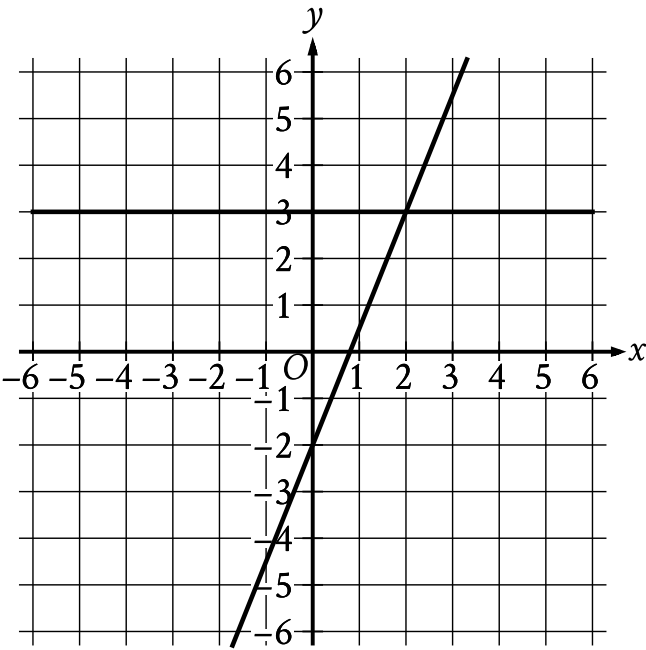
The correct answer is 2.6. According to the model, the head width, in millimeters, of a worker bumblebee can be estimated by adding 0.6 to 4 times the body weight, in grams, of the bee. Let x represent the body weight, in grams, of a worker bumblebee and let y represent the head width, in millimeters. Translating the verbal description of the model into an equation yields $y = 0.6 + 4x$. Substituting 0.5 grams for x in this equation yields $y = 0.6 + 4(0.5)$, or $y = 2.6$. Therefore, a worker bumblebee with a body weight of 0.5 grams has an estimated head width of 2.6 millimeters. Note that 2.6 and 13/5 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID b0fc3166

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: b0fc3166



The graph of a system of linear equations is shown. What is the solution (x, y) to the system?

- A. $(0, 3)$
- B. $(1, 3)$
- C. $(2, 3)$
- D. $(3, 3)$

ID: b0fc3166 Answer

Correct Answer: C

Rationale

Choice C is correct. The solution to this system of linear equations is represented by the point that lies on both lines shown, or the point of intersection of the two lines. According to the graph, the point of intersection occurs when $x = 2$ and $y = 3$, or at the point $(2, 3)$. Therefore, the solution (x, y) to the system is $(2, 3)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID db422e7f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: db422e7f

Line p is defined by $4y + 8x = 6$. Line r is perpendicular to line p in the xy -plane. What is the slope of line r ?

ID: db422e7f Answer

Correct Answer: .5, 1/2

Rationale

The correct answer is $\frac{1}{2}$. For an equation in slope-intercept form $y = mx + b$, m represents the slope of the line in the xy -plane defined by this equation. It's given that line p is defined by $4y + 8x = 6$. Subtracting $8x$ from both sides of this equation yields $4y = -8x + 6$. Dividing both sides of this equation by 4 yields $y = -\frac{8}{4}x + \frac{6}{4}$, or $y = -2x + \frac{3}{2}$. Thus, the slope of line p is -2 . If line r is perpendicular to line p , then the slope of line r is the negative reciprocal of the slope of line p . The negative reciprocal of -2 is $-\frac{1}{(-2)} = \frac{1}{2}$. Note that 1/2 and .5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 590f2187

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	<div><div></div><div></div><div></div></div>

ID: 590f2187

If $3x - 27 = 24$, what is the value of $x - 9$?

- A. 1
- B. 8
- C. 24
- D. 35

ID: 590f2187 Answer

Correct Answer: B

Rationale

Choice B is correct. Dividing each side of the given equation by 3 yields $x - 9 = 8$. Therefore, the value of $x - 9$ is 8.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the value of $3x - 27$, not $x - 9$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 01682aa5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: 01682aa5

Line p is defined by $2y + 18x = 9$. Line r is perpendicular to line p in the xy -plane. What is the slope of line r ?

- A. -9
- B. $-\frac{1}{9}$
- C. $\frac{1}{9}$
- D. 9

ID: 01682aa5 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that line r is perpendicular to line p in the xy -plane. This means that the slope of line r is the negative reciprocal of the slope of line p . If the equation for line p is rewritten in slope-intercept form $y = mx + b$, where m and b are constants, then m is the slope of the line and $(0, b)$ is its y -intercept. Subtracting $18x$ from both sides of the equation $2y + 18x = 9$ yields $2y = -18x + 9$. Dividing both sides of this equation by 2 yields $y = -9x + \frac{9}{2}$. It follows that the slope of line p is -9 . The negative reciprocal of a number is -1 divided by the number. Therefore, the negative reciprocal of -9 is $\frac{-1}{-9}$, or $\frac{1}{9}$. Thus, the slope of line r is $\frac{1}{9}$.

Choice A is incorrect. This is the slope of line p , not line r .

Choice B is incorrect. This is the reciprocal, not the negative reciprocal, of the slope of line p .

Choice D is incorrect. This is the negative, not the negative reciprocal, of the slope of line p .

Question Difficulty: Medium

Question ID f2b63f49

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	<div><div></div><div></div><div></div></div>

ID: f2b63f49

$8x - 7x + 130 = 260$ What value of x is the solution to the given equation?

ID: f2b63f49 Answer

Correct Answer: 130

Rationale

The correct answer is **130**. It's given that $8x - 7x + 130 = 260$. Combining like terms on the left-hand side of this equation yields $x + 130 = 260$. Subtracting **130** from each side of this equation yields $x = 130$. Therefore, the value of x that's the solution to the given equation is **130**.

Question Difficulty: Easy

Question ID 45cfb9de

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	<div><div></div><div></div><div></div></div>

ID: 45cfb9de

Adam’s school is a 20-minute walk or a 5-minute bus ride away from his house. The bus runs once every 30 minutes, and the number of minutes, w , that Adam waits for the bus varies between 0 and 30. Which of the following inequalities gives the values of w for which it would be faster for Adam to walk to school?

- A. $w - 5 < 20$
- B. $w - 5 > 20$
- C. $w + 5 < 20$
- D. $w + 5 > 20$

ID: 45cfb9de Answer

Correct Answer: D

Rationale

Choice D is correct. It is given that w is the number of minutes that Adam waits for the bus. The total time it takes Adam to get to school on a day he takes the bus is the sum of the minutes, w , he waits for the bus and the 5 minutes the bus ride takes; thus, this time, in minutes, is $w + 5$. It is also given that the total amount of time it takes Adam to get to school on a day that he walks is 20 minutes. Therefore, $w + 5 > 20$ gives the values of w for which it would be faster for Adam to walk to school.

Choices A and B are incorrect because $w - 5$ is not the total length of time for Adam to wait for and then take the bus to school. Choice C is incorrect because the inequality should be true when walking 20 minutes is faster than the time it takes Adam to wait for and ride the bus, not less.

Question Difficulty: Hard

Question ID 06fc1726

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: 06fc1726

If f is the function defined by $f(x) = \frac{2x-1}{3}$,
what is the value of $f(5)$?

- A. $\frac{4}{3}$
- B. $\frac{7}{3}$
- C. 3
- D. 9

ID: 06fc1726 Answer

Correct Answer: C

Rationale

Choice C is correct. If $f(x) = \frac{2x-1}{3}$, then $f(5) = \frac{2(5)-1}{3} = \frac{10-1}{3} = \frac{9}{3} = 3$.

Choice A is incorrect and may result from not multiplying x by 2 in the numerator. Choice B is incorrect and may result from dividing $2x$ by 3 and then subtracting 1. Choice D is incorrect and may result from evaluating only the numerator $2x - 1$.

Question Difficulty: Easy

Question ID 05417146

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	<div><div></div><div></div><div></div></div>

ID: 05417146

$w + 7 = 357$ What value of w is the solution to the given equation?

- A. 51
- B. 350
- C. 364
- D. 3,577

ID: 05417146 Answer

Correct Answer: B

Rationale

Choice B is correct. Subtracting 7 from each side of the given equation yields $w = 350$. Therefore, the value of w that is the solution to the given equation is 350 .

Choice A is incorrect. This is the value of w that is the solution to the equation $7w = 357$, not $w + 7 = 357$.

Choice C is incorrect. This is the value of w that is the solution to the equation $w - 7 = 357$, not $w + 7 = 357$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID e3cf671f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: e3cf671f

The function f is defined by $f(x) = 4x + k(x - 1)$, where k is a constant, and $f(5) = 32$. What is the value of $f(10)$?

ID: e3cf671f Answer

Correct Answer: 67

Rationale

The correct answer is **67**. It's given that $f(5) = 32$. Therefore, for the given function f , when $x = 5$, $f(x) = 32$. Substituting **5** for x and **32** for $f(x)$ in the given function $f(x) = 4x + k(x - 1)$ yields $32 = 4(5) + k(5 - 1)$, or $32 = 20 + 4k$. Subtracting **20** from each side of this equation yields $12 = 4k$. Dividing each side of this equation by **4** yields $k = 3$. Substituting **3** for k in the given function $f(x) = 4x + k(x - 1)$ yields $f(x) = 4x + 3(x - 1)$, which is equivalent to $f(x) = 4x + 3x - 3$, or $f(x) = 7x - 3$. Substituting **10** for x into this equation yields $f(10) = 7(10) - 3$, or $f(10) = 67$. Therefore, the value of $f(10)$ is **67**.

Question Difficulty: Medium

Question ID 571174f3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: 571174f3

$$\frac{2}{5}x + \frac{7}{5}y = \frac{2}{7}gx + ky = \frac{5}{2}$$

In the given system of equations, g and k are constants. The system has infinitely many solutions. What is the value of $\frac{g}{k}$?

ID: 571174f3 Answer

Correct Answer: .2857, 2/7

Rationale

The correct answer is $\frac{2}{7}$. It's given that the system has infinitely many solutions. A system of two linear equations has infinitely many solutions if and only if the two linear equations are equivalent. Multiplying each side of the first equation in the system by $\frac{35}{4}$ yields $\frac{35}{4}(\frac{2}{5}x + \frac{7}{5}y) = \frac{35}{4}(\frac{2}{7})$, or $\frac{7}{2}x + \frac{49}{4}y = \frac{5}{2}$. Since this equation is equivalent to the second equation and has the same right side as the second equation, the coefficients of x and y , respectively, should also be the same. It follows that $g = \frac{7}{2}$ and $k = \frac{49}{4}$. Therefore, the value of $\frac{g}{k}$ is $\frac{\frac{7}{2}}{\frac{49}{4}}$, or $\frac{2}{7}$. Note that 2/7, .2857, 0.285, and 0.286 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID e723bd67

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	<div><div></div><div></div><div></div></div>

ID: e723bd67

$2x - y > 883$

For which of the following tables are all the values of x and their corresponding values of y solutions to the given inequality?

A.

x	y
440	0
441	-2
442	-4

B.

x	y
440	0
442	-2
441	-4

C.

x	y
442	0
440	-2
441	-4

D.

x	y
442	0
441	-2
440	-4

ID: e723bd67 Answer

Correct Answer: D

Rationale

Choice D is correct. All the tables in the choices have the same three values of x , **440**, **441**, and **442**, so each of the three values of x can be substituted in the given inequality to compare the corresponding values of y in each of the tables. Substituting **440** for x in the given inequality yields $2(440) - y > 883$, or $880 - y > 883$. Subtracting **880** from both sides of this inequality yields $-y > 3$. Dividing both sides of this inequality by -1 yields $y < -3$. Therefore, when $x = 440$, the corresponding value of y must be less than -3 . Substituting **441** for x in the given inequality yields $2(441) - y > 883$, or $882 - y > 883$. Subtracting **882** from both sides of this inequality yields $-y > 1$. Dividing both sides of this inequality by -1 yields $y < -1$. Therefore, when $x = 441$, the corresponding value of y must be less than -1 . Substituting **442** for x in the given inequality yields $2(442) - y > 883$, or $884 - y > 883$. Subtracting **884** from both sides of this inequality yields $-y > -1$. Dividing both sides of this inequality by -1 yields $y < 1$. Therefore, when $x = 442$, the corresponding value of y must be less than **1**. For the table in choice D, when $x = 440$, the corresponding value of y is -4 , which is less than -3 ; when $x = 441$, the corresponding value of y is -2 , which is less than -1 ; when $x = 442$, the corresponding value of y is **0**, which is less than **1**. Therefore, the table in choice D gives values of x and their corresponding values of y that are all solutions to the given inequality.

Choice A is incorrect. When $x = 440$, the corresponding value of y in this table is **0**, which isn't less than -3 .

Choice B is incorrect. When $x = 440$, the corresponding value of y in this table is **0**, which isn't less than -3 .

Choice C is incorrect. When $x = 440$, the corresponding value of y in this table is -2 , which isn't less than -3 .

Question Difficulty: Medium

Question ID 6863c7ce

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<div><div></div><div></div><div></div></div>

ID: 6863c7ce

$d = 16t$

The given equation represents the distance d , in inches, where t represents the number of seconds since an object started moving. Which of the following is the best interpretation of **16** in this context?

- A. The object moved a total of **16** inches.
- B. The object moved a total of **16t** inches.
- C. The object is moving at a rate of **16** inches per second.
- D. The object is moving at a rate of $\frac{1}{16}$ inches per second.

ID: 6863c7ce Answer

Correct Answer: C

Rationale

Choice C is correct. It’s given that in the equation $d = 16t$, d represents the distance, in inches, and t represents the number of seconds since an object started moving. In this equation, t is being multiplied by **16**. This means that the object’s distance increases by **16** inches each second. Therefore, the best interpretation of **16** in this context is that the object is moving at a rate of **16** inches per second.

Choice A is incorrect and may result from conceptual errors.

Choice B is incorrect. This is the best interpretation of **16t**, rather than **16**, in this context.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID 979c6ebc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	<div><div></div><div></div><div></div></div>

ID: 979c6ebc

$7x + 6y = 5$ $28x + 24y = 20$

For each real number r , which of the following points lies on the graph of each equation in the xy -plane for the given system?

- A. $(r, -\frac{6r}{7} + \frac{5}{7})$
- B. $(r, \frac{7r}{6} + \frac{5}{6})$
- C. $(\frac{r}{4} + 5, -\frac{r}{4} + 20)$
- D. $(-\frac{6r}{7} + \frac{5}{7}, r)$

ID: 979c6ebc Answer

Correct Answer: D

Rationale

Choice D is correct. Dividing each side of the second equation in the given system by 4 yields $7x + 6y = 5$. It follows that the two equations in the given system are equivalent and any point that lies on the graph of one equation will also lie on the graph of the other equation. Substituting r for y in the equation $7x + 6y = 5$ yields $7x + 6r = 5$. Subtracting $6r$ from each side of this equation yields $7x = -6r + 5$. Dividing each side of this equation by 7 yields $x = -\frac{6r}{7} + \frac{5}{7}$. Therefore, the point $(-\frac{6r}{7} + \frac{5}{7}, r)$ lies on the graph of each equation in the xy -plane for each real number r .

Choice A is incorrect. Substituting r for x in the equation $7x + 6y = 5$ yields $7r + 6y = 5$. Subtracting $7r$ from each side of this equation yields $6y = -7r + 5$. Dividing each side of this equation by 6 yields $y = -\frac{7r}{6} + \frac{5}{6}$. Therefore, the point $(r, -\frac{7r}{6} + \frac{5}{6})$, not the point $(r, -\frac{6r}{7} + \frac{5}{7})$, lies on the graph of each equation.

Choice B is incorrect. Substituting r for x in the equation $7x + 6y = 5$ yields $7r + 6y = 5$. Subtracting $7r$ from each side of this equation yields $6y = -7r + 5$. Dividing each side of this equation by 6 yields $y = -\frac{7r}{6} + \frac{5}{6}$. Therefore, the point $(r, -\frac{7r}{6} + \frac{5}{6})$, not the point $(r, \frac{7r}{6} + \frac{5}{6})$, lies on the graph of each equation.

Choice C is incorrect. Substituting $\frac{r}{4} + 5$ for x in the equation $7x + 6y = 5$ yields $7(\frac{r}{4} + 5) + 6y = 5$, or $(\frac{7r}{4} + 35) + 6y = 5$. Subtracting $(\frac{7r}{4} + 35)$ from each side of this equation yields $6y = -\frac{7r}{4} - 35 + 5$, or $6y = -\frac{7r}{4} - 30$. Dividing each side of this equation by 6 yields $y = -\frac{7r}{24} - 5$. Therefore, the point $(\frac{r}{4} + 5, -\frac{7r}{24} - 5)$, not the point $(\frac{r}{4} + 5, -\frac{r}{4} + 20)$, lies on the graph of each equation.

Question Difficulty: Hard